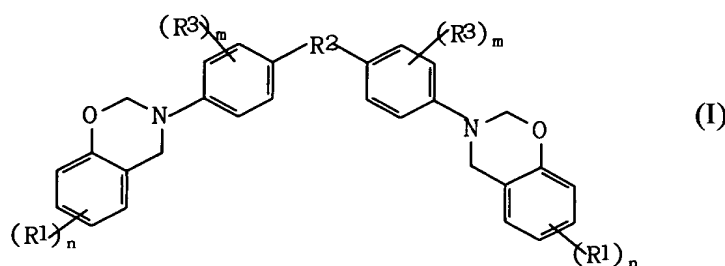


CLAIMS

What is claimed is:

1. A halogen free resin composition, comprising :

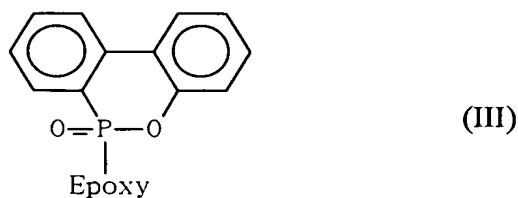
- (A) one or more phosphorous-containing epoxy resins;
- (B) a hardener; and
- (C) a hardening accelerator; wherein the hardener of component (B) has the structure represented by the following formula (I) :



wherein, R^1 is a group selected from the group consisting of an alkyl group, an alkenyl group, an alkoxyl group, a hydroxy group, and an amino group; R^2 is a group selected from the group consisting of a chemical bond, an alkylene group, O, S, and SO_2 ; R^3 is H or an alkyl group; m and n are integers from 0 to 4.

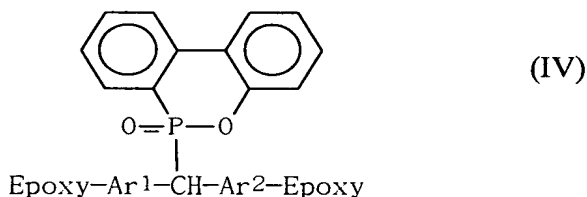
2. The composition of claim 1, wherein R^1 is t-butyl; R^2 is methylene group; m is 0; and n is 1.
3. The composition of claim 1, wherein the hardener having the structure represented by the formula (I) is one prepared by the reaction of a phenolic compound, an aromatic diamine compound, and an aldehyde compound in the presence of a solvent.
4. The composition of claim 3, wherein the phenolic compound is t-butyl phenol; the aromatic diamine compound is 4,4'-diamino-diphenyl methane; the aldehyde compound is paraformaldehyde; and the solvent is aromatic hydrocarbon solvent.
5. The composition of claim 1, wherein the phosphorus-containing epoxy resin is a

side chain type phosphorous-containing epoxy resin represented by the following formula (III):

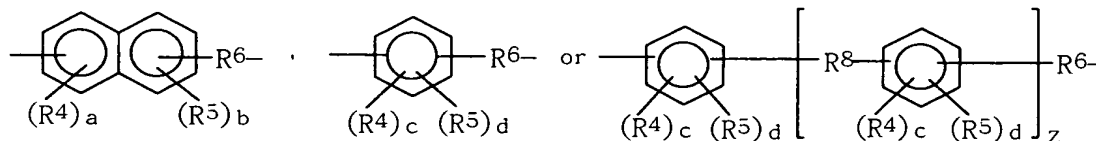


wherein Epoxy is one of the epoxy resin which one of epoxy groups is ring-opened.

6. The composition of claim 5, wherein the side chain type phosphorous-containing epoxy resin is one obtained by incorporating 9,10-dihydro-9-oxa-10-phosphorous phenanthrenyl-10-oxide into the structure of epoxy resin.
7. The composition of claim 1, wherein the phosphorus-containing compound is the side chain type phosphorous-containing epoxy resin represented by the following formula (IV):



wherein Epoxy is as defined above; and Ar¹ and Ar² are independently selected from:



R⁴ is selected from the group consisting of -OH, -COOH, -NH₂, -CHO, -SH, -SO₃H, -CONH₂, -NHCOOR⁷, and anhydride; R⁵ is selected from the group consisting of hydrogen, an alkyl group, an alkoxy group, a nitro group, and an aryl group; R⁶ is a chemical bond or an alkylene group; R⁷ is hydrogen or alkyl

group; R^8 is selected from the group consisting of a chemical bond, $-CR^5R^7-$, $-O-$, $-CO-$, $-S-$, $-SO-$, and $-SO_2-$; a and b are independent integers from 0 to 6, and $a+b \leq 6$; c and d are independent integers from 0 to 4, and $c+d \leq 4$; and z is an integer from 1 to 20.

8. The composition of claim 7, wherein the side chain type phosphorous-containing epoxy resin is one prepared by undergoing the addition reaction of 9,10-dihydro-9-oxa-10-phosphorous phenanthrenyl-10-oxide with an aromatic aldehyde compound and undergoing the condensation reaction with an aromatic compound having active hydrogen to produce a phosphorus-containing compound, and subsequently reacting the phosphorus-containing compound with an epoxy resin.
9. The composition of claim 8, wherein the aromatic aldehyde compound is 4-hydroxy benzaldehyde, and the aromatic compound having active hydrogen is phenol.
10. The composition of claim 6 or 8, wherein the epoxy resin is derived from the monomers selected from the group consisting of bisphenol glycidyl ether, biphenol glycidyl ether, dihydroxybenzene glycidyl ether, glycidyl ether containing nitrogen ring, glycidyl ether of dihydroxynaphthalene, phenolic polyglycidyl ether, and polyhydroxy glycidyl ether.
11. The composition of claim 1, wherein one or more phosphorous-containing epoxy resins of component (A) are used in an amount of 40 to 80 wt % based on the total amount of the hardener of component (B).
12. The composition of claim 1, wherein the hardening accelerator (C) is selected from the group consisting of tertiary amine, tertiary phosphine, quaternary ammonium salts, quaternary phosphonium salts, the complex salt of trifluoroboride, lithium compound, imidazole compound, and any mixture thereof.
13. The composition of claim 1, wherein the hardening accelerator of component (C) is used in 0.01 to 1 wt % based on the total amount of the resin composition.

14. The composition of claim 1, wherein the composition is useful in the application of adhesives, composite materials, laminated plates, printed circuit boards, copper foil adhesives, inks used for build-up process, and semiconductor packaging materials.